Lab no 04: Breadboard & NAND IC

The purpose of this Lab is to: be familiar with the breadboard and connect different components, like LED, resistor, and NAND IC, on the Breadboard.

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Required Components

- Breadboard.
- 5V battery.
- Jumper wires.
- 330-ohm Resistor.
- LEDs.
- NAND IC 7400.

Part 1: Connect LED on the Breadboard

- **Step 1: The Breadboard and How it Works**
  - The breadboard is used to build circuits by connecting different components.
  - As shown in Figure. 1, the bus terminals are the long strips on the side where you connect power lines (+ve power supply and ground).
  - As shown in Figure. 1, the terminal strips are the short strips in the middle where you will build your circuit.
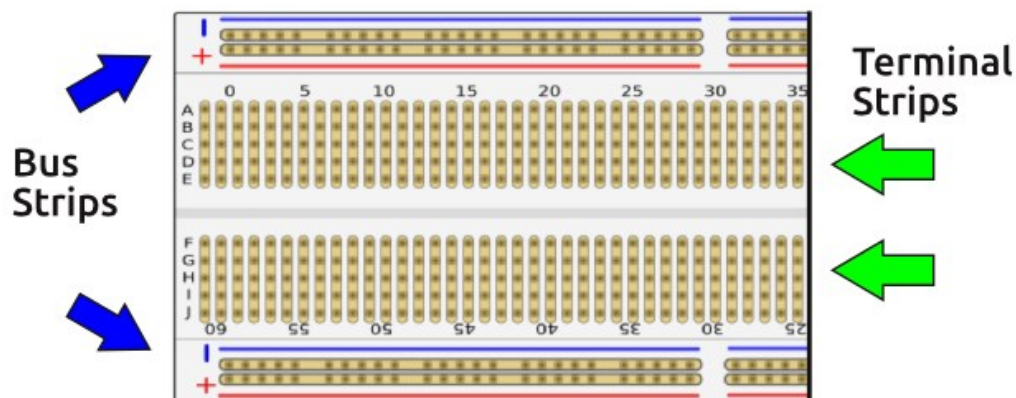

Figure 1. breadboard

- **Step 2: Powering Breadboard Safely**

  o Bring your power source, here you will use a 5V battery, as shown in Figure.2.

  o Use wires as shown in Figure 2, Connects the black wire to the blue bus terminal or ground and the red wire to the red bus terminal.
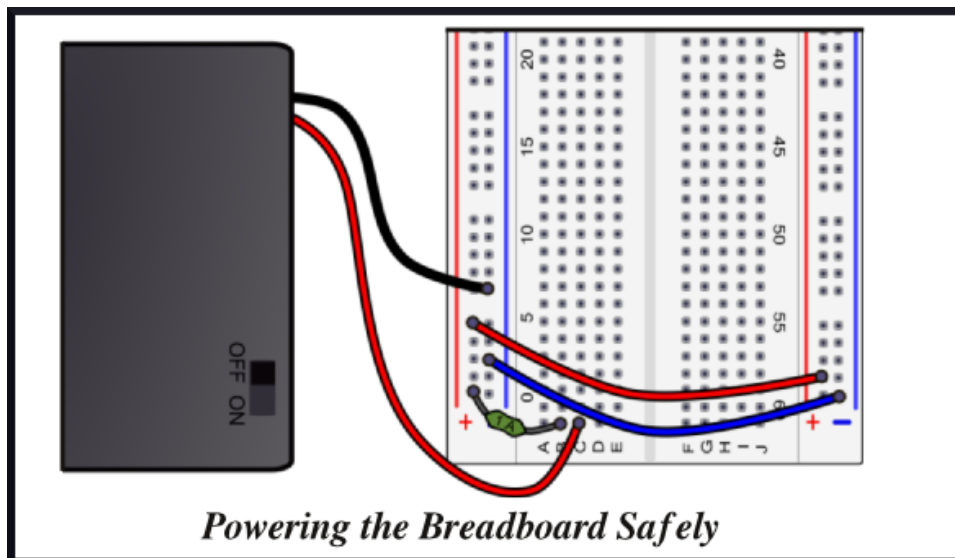

Powering the Breadboard Safely

Figure 2. powering the breadboard

- **Step 3: read and select a Resistor**

  o Download the resistor color code, you can find an app on the android market to help you read the resistors.

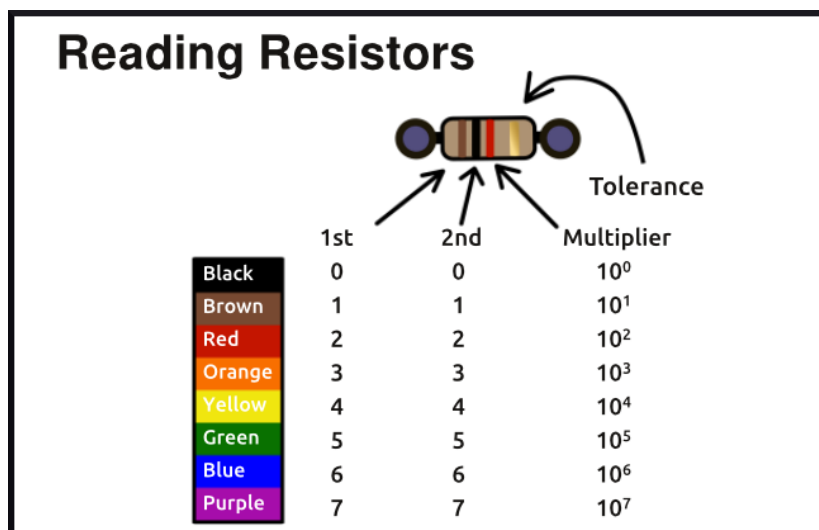 o Now, get a 330-ohm resistor, and verify its value based on the color code, shown in Figure 3.

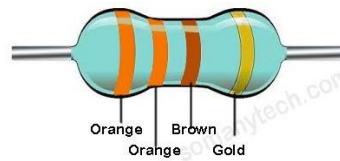Figure 3. Resistance Color Code.

Fig. showing color code of 330 ohm resistor

330-ohm resistor color code for 4-band is calculated as:

- o (1st digit) = Orange = 3
- o (2nd digit) = Orange = 3
- o (multiplier) = Brown = 1 = 10^1 = 10
- o (tolerance) = Gold= ±5%
- o 33×10±5% –> 330±5% ohms –> 330±5% Ω

The real value of the 330 Ω resistor is between 313.5 Ω to 346.5 Ω

- **Step 4: LED Circuit**
  - o As shown in Figure 4, The LED has two pins, Cathode and Anode.
  - o Connect the LED cathode to 0 V on the breadboard, as shown in Figure 4.
  - o Connect the LED anode to one terminal of the 330-ohm resistor, as shown in Figure 4.
  - o Connect the other terminal of the 330-ohm resistor to the 5v on the breadboard, as shown in Figure 4. You can see the LED is ON.
  - o Now, connect the other terminal of the 330-ohm resistor to the 0v on the breadboard, rather than the 5v line. You can see the LED is OFF.
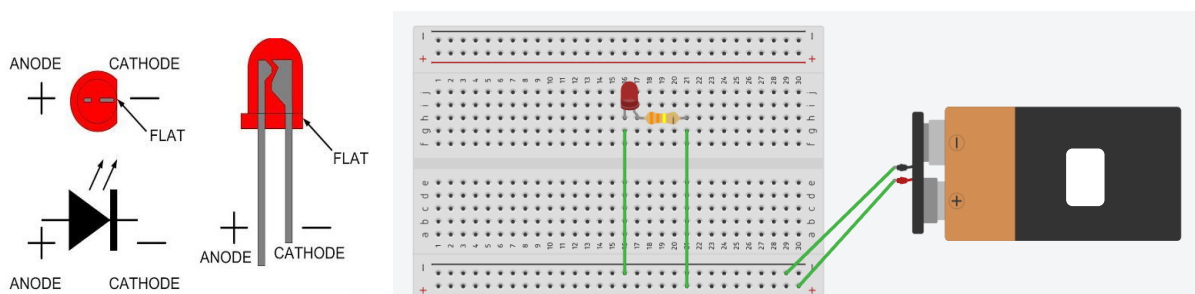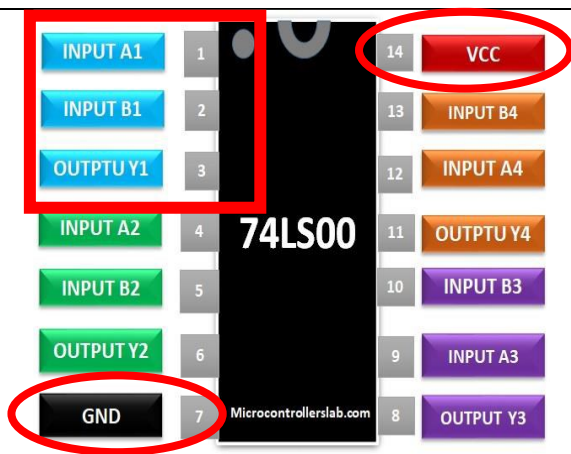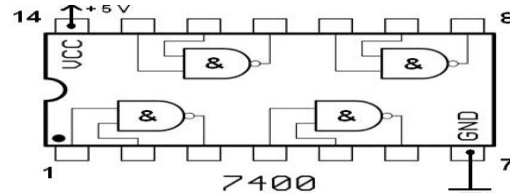

Figure 4. Turn on LED on the breadboard.

Part 2: Connect & Test the NAND IC on the Breadboard.

A 7400 is a quad NAND gate chip. This means it contains 4 NAND gates inside it, as shown in Figure 4.

Figure 4. NAND Gate IC, Schematic, Pin Configuration, and truth table.

Input A	Input B	Output Q
0	0	1
0	1	1
1	0	1
1	1	0

o As shown in Figure 4, Pin 7 is the ground and Pin 14 is VCC. So, connect 7400 Pin 7 to the ground line, and Pin 14 to the 5V power line, as shown in Figure 5.

o Connect Inputs of the first NAND gate, Input A1 (Pin 1) and Input B1 (Pin 2), to the Ground (logic 0), the purple two wires shown in Figure 5.

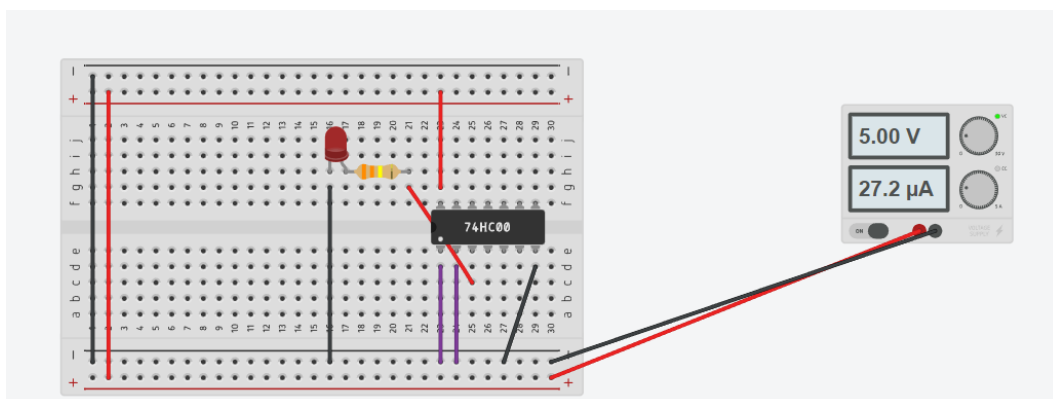o Connect Output Y1 to the resistor, as shown in Figure 5.

Figure 5. Test NAND IC on the Breadboard.

Note

❖ **Lab NANC IC**

https://www.youtube.com/watch?v=d1PTflUt1U4

❖ **ICS datasheets, Simulator, Proteus download link**

https://drive.google.com/drive/folders/1u8BetHA6FxWgylGntXkzlJKgvWMOLriT?fbclid=IwAR3NH4paqkEhMjA1bdD5RT9j5rCOe94NPd21WA-BJj6vEcQlchucLiCYh2s

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❖ **Resistor Calculator**

https://www.calculator.net/resistor-calculator.html